PATENT SPECIFICATION (11) 1 327 653

NO DRAWINGS

1 327 653

(21) Application No. 11464/71 (22) Filed 26 April 1971

(31) Convention Application No. P 20 21 632.4

(32) Filed 2 May 1970 in

(33) Germany (DT)

(44) Complete Specification published 22 Aug. 1973

(51) International Classification B29F 1/00 B29C 29/00 B24D 3/00

(52) Index at acceptance

B5A 1R14B 1R14C1C 1R14C1X 1R22X 1R41 1R58 1R64 1R66 3DX

C4V X

(19)

(72) Inventors HENRY MARHAN and HEINZ E. HINZ

(54) PROCESS FOR MANUFACTURING ABRASIVE BODIES BONDED WITH PLASTICS MATERIAL OR RUBBER

(71) We, METALLGESELLSCHAFT AKTIENGESELLSCHAFT, a body corporate organised under the Laws of Germany, of 14 Reuterweg, Frankfurt-on-the-Main, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a process for manufacturing abrasive bodies bonded with plastics material or rubber.

It has been proposed to make abrasive bodies by moulding a mixture of a binder of granulated or powdered rubber or plasties material and a granular or powdered grinding or polishing material, particularly at an elevated temperature. It has also been proposed to make such abrasive bodies, which are bonded with rubber or plasties material, by casting a mixture of particulate abrasive material and liquefied plastics material in a mould. This method of manufacture is fairly time-consuming, which is a great disadvantage for mass production. Besides, in most of the abovementioned methods of manufacture, a uniform distribution of the grinding or polishing material within the finished abrasive bodies is not ensured and the density of these bodies is not uniform throughout their cross-section so that they are not economical in consumption. For these reasons, the abrasive action of a given abrasive body varies in different stages of its wear so that the abrasive effect must be carefully checked.

It has been proposed to avoid an irregular distribution of the abrasive material in abrasive bodies bonded with plastics material by filling the granular abrasive material into a mould which conforms to the abrasive member to be made and which is provided with nozzles and venting conduits, compacting the granular abrasive material, e.g., by an ultrasonic treatment, and injecting a thermosetting or thermoplastic synthetic material under pressure through the nozzles into the interstices between the compacted particles of the abrasive material. Even this process does not ensure in many cases a uniform distribution of the granular abrasive material and the process can be used only with a relatively coarse-grained abrasive material. Besides, the process is complicated and expensive and for this reason cannot be applied to the mass production of abrasive bodies bonded with plastics material or rubber.

It has been proposed to make an abrasive body in the form of a gear finishing tool by pressure casting a plastic abrasive resin compound. In this pressure casting operation, the compound is introduced under pressure into a substantially closed annular space, the axis of which is vertical, there being vent openings in a cover plate forming the upper surface of the space. The compound is introduced through a fitting positioned between two vent openings and flows circumferentially around the space expelling air through the vent openings. As the compound reaches the vent openings adjacent the fitting, the compound starts to flow out of the openings and, at this time, suitable plugs of plastics material are inserted in the openings. The casting operation continues until the annular space is filled and all the vent openings have been plugged.

In contradistinction to this previous proposal, the present invention provides a process for manufacturing an abrasive body bonded with a plastics material or rubber, wherein a mixture of granular or powdered grinding or polishing material and a binder comprising plastics material or rubber, the binder being in the form of crumbs, a

[Price 25p]

powder, a liquid or a combination of two or more such forms, is injection moulded in a mould comprising a central sprue connected to a plurality of mould cavities, whereafter the resulting abrasive bodies formed in said mould cavities are separated from the resulting sprues. The resulting sprues are conveniently comminuted and added to the next charge of mixture to be injection moulded.

In contradistinction to a pressure casting process in which the material is introduced relatively slowly into a mould cavity, particularly in the previously proposed process where each pair of vent openings must be plugged before the material can be allowed to flow to the next pair, the use of injection moulding in accordance with the present invention causes intensive mixing of the ingredients and, as the material is injected relatively quickly into the mould cavity, prevents segregation of the constituents of the injected material.

The present process is mainly based on the recognition that the injection moulding process can be carried out even if the plastics moulding material contains a high proportion of fillers, particularly highly abrasive fillers, and even in intricate moulds. For use in industrial abrading operations, a body of plastics materials must contain a filler consisting of a grinding or polishing material in an amount of at least 5% of the total weight of the body. It has been found that the present process may be used to make abrasive bodies which contain up to 80% by weight of the abrasive material. High requirements of abrading technology will be met by a grinding or polishing body which contains grinding or polishing material in an amount of 40 to 60% by weight of the finished body. For this reason it will be suitable in the present process to provide a mixture which is to be injection-moulded and which contains grinding or polishing material in an amount of 40 to 60% of the weight of the finished body.

The present process is particularly suitable for the manufacture of abrasive bodies which are used in bulk for drum grinding processes or vibrating drum grinding processes. The abrasive bodies used in these processes must be relatively small so that a mass production technique is advantageous for the manufacture of said abrasive bodies. Furthermore, these abrasive bodies must have a certain external shape and for this reason cannot be made easily and with a uniform smooth surface by the previously proposed processes, particularly the spherical shapes which are often required when the abrasive bodies are used in bulk.

The present process has the advantage that, contrary to the previously proposed processes, abrasive material having a desired particle size may be used without fear of segregation, and any kind of rubber or plastics material may be used in the present process. Materials which are particularly suitable include high-pressure and low-pressure polyethylene, polypropylene, polystyrene and polyvinyl chloride. Instead of the plastics materials, precursors of such plastics materials may be used, provided that they react as desired during the moulding process so that the reaction product removed from the mould has a sufficiently high dimensional stability. The injection-moulding machine may be adapted to be suitable to operate with such starting products. Agents for foaming the plastics material may be added to the mixture to be moulded so that porous abrasive bodies can also be made. Colouring matter may be added so that the finished abrasive body has a colour which indicates the use to which it can be put in view of its composition.

The invention will now be illustrated by the following Examples.

EXAMPLE 1

A mixture of 30 parts by weight polypropylene powder and 70 parts by weight silicon carbide having a particle size of about 10 microns was made in an impeller mixer. The resulting mixture was charged into the plasticizing screw of an injection-moulding machine, in which the mixture was injected into a mould. The mould had a central sprue connected to 48 mould cavities. Each moulding wass tar-shaped and had an outside diameter of 25 millimetres and a thickness of 12 millimetres. About 2 kilograms of these mouldings were made per minute. To remove the sprues from the abrasive bodies, 50 kilograms of the latter were charged into a rotating screening drum. When the screening drum had been rotated for about five minutes, all the mouldings had dropped through the screening drum into a container placed under the drum whereas the sprues remained in the screening drum and were removed through the charging opening before the next charge was introduced. The sprues were comminuted and then added to the next charge of raw material.

EXAMPLE 2

In the machine used in Example 1, a mixture consisting of 60 parts by weight polyethylene powder and 40 parts by weight electrocorundum having a particle size of 10 microns was injection-moulded. A mould was used which had 60 mould cavities, in which abrasive bodies in the form of tetrahedra having a height of 15 millimetres

were made at a rate of 2 kilograms per minute.

EXAMPLE 3

In the machine used in the preceding Examples, polishing bodies were made from a mixture of 95 parts by weight of polystyrene powder and 5 parts by weight of quartz powder. A mould having 60 mould cavities was used, in which spherical abrasive bodies were made at a rate of 2 kilograms per minute.

WHAT WE CLAIM IS:—

1. A process for manufacturing an abrasive body bonded with plastics material or rubber, wherein a mixture of granular or powdered grinding or polishing material and a binder comprising plastics material or rubber, the binder being in the form of crumbs, a powder, a liquid or a combination of two or more such forms, is injection moulded in a mould comprising a central sprue connected to a plurality of mould cavities, whereafter the resulting abrasive bodies formed in said mould cavities are separated from the resulting sprues.

2. A process as claimed in Claim 1, wherein the mixture to be moulded contains grinding or polishing material in an amount of 5 to 80% of the weight of the finished body.

3. A process as claimed in Claim 1 or 2, wherein the mixture to be moulded contains grinding or polishing material in an amount of 40 to 60% of the weight of the finished body.

4. A process as claimed in any preceding Claim, wherein the resulting sprues are comminuted and added to the next charge of mixture to be injection moulded.

5. A process for manufacturing an abrasive body substantially as hereinbefore described in any one of the foregoing Examples.

6. An abrasive body manufactured by the process claimed in any preceding Claim.

TREGEAR, THIEMANN & BLEACH,
Chartered Patent Agents,
Melbourne House,
Aldwych,
London, W.C.1.
Agents for the Applicants.

Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1973.
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY,
from which copies may be obtained.